Generation of AIRS Radiance Dataset for Climate Studies

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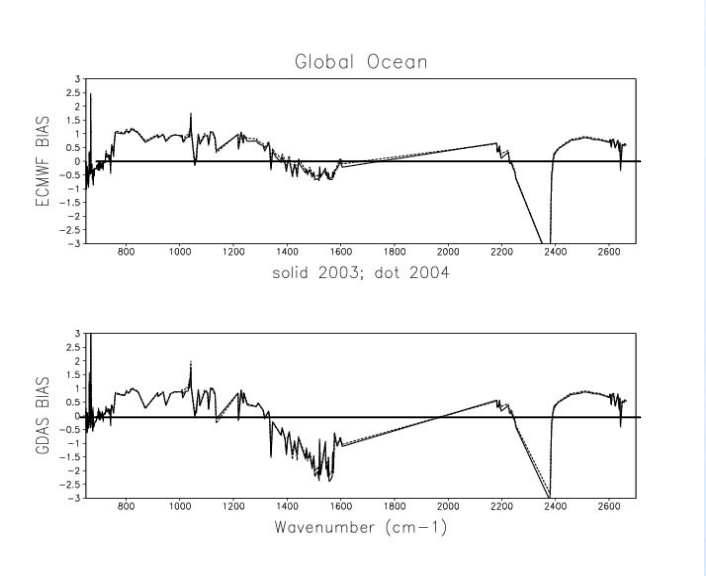
Motivation

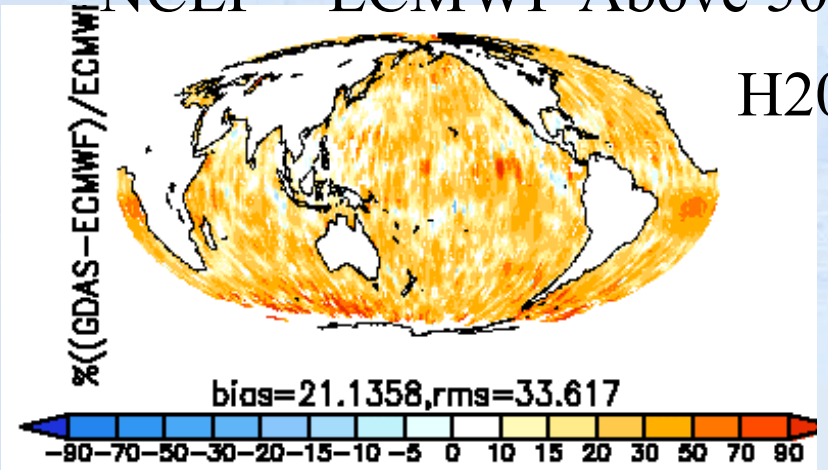
- AIRS radiances are climate quality
- Key climate forcing, feedback and response variables are imbedded in AIRS
- Monthly maps of AIRS radiances should be valuable to the climate community
- Must angle adjust AIRS to a reference angle to generate monthly maps – limb adjustment

Applications of Mapped Spectrally Resolved Radiances

- Compare radiances with simulated radiances from model analyses
- Compare different years to see how the outgoing infrared radiances have changed.



NCEP – ECMWF Above 500 mb H20



AIRS Lib Adjustment Methodology:

Step 1). Limb adjust the off-nadir PCS to the nadir PCS.

Step 2). Reconstructed the observation using the limb-adjusted PCS.

- The first few PCS contain the primary information coming from the earth…

- They are highly correlated to most of the channels, especially those from the surface to about 200mb… which contribute to the most of the limb effect.

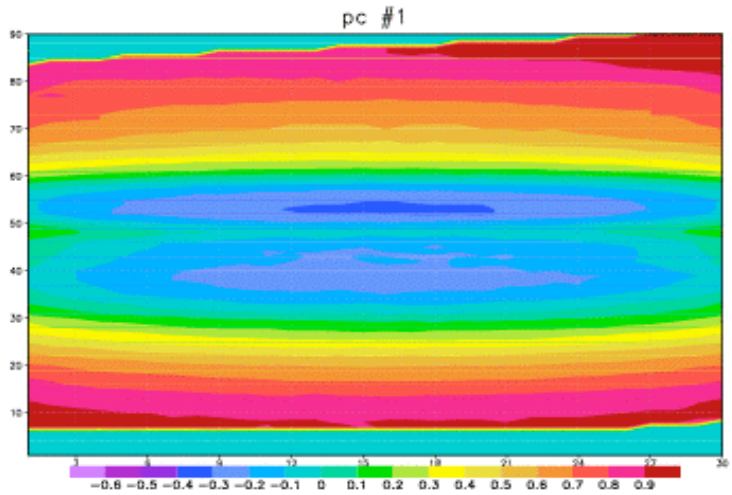
We use first four PCS plus the PCS which is being predicted as the predictors:

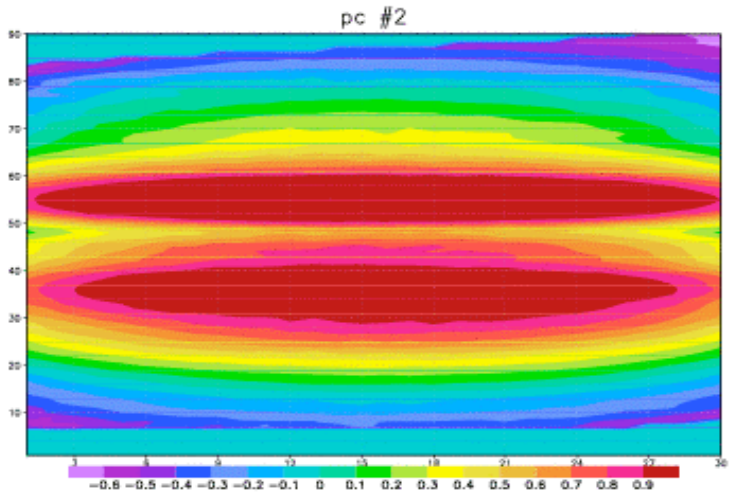
$Y = x^T b$

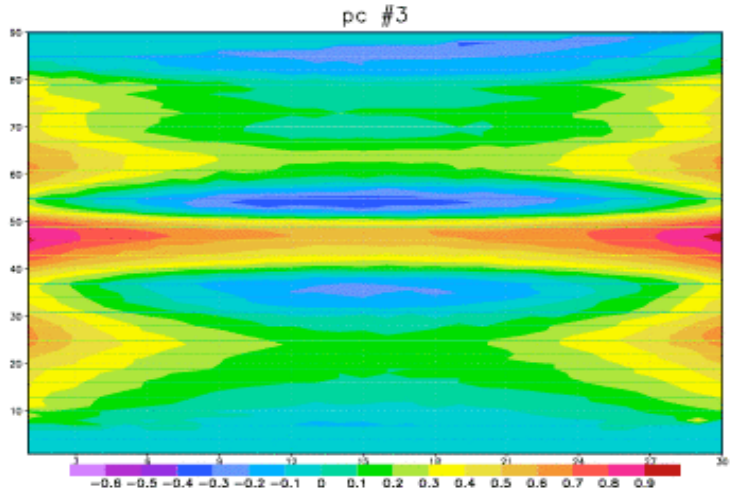
X is a vector of unadjusted pcs, and b is a vector of coefficients.

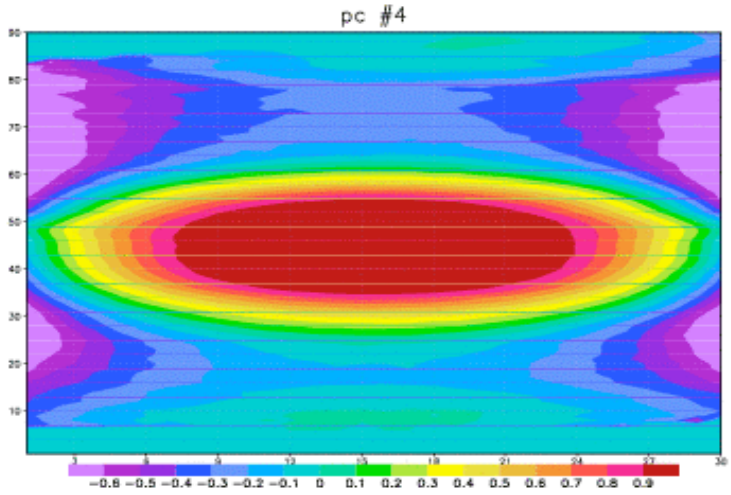
Y and x are means over latitude bands from a large time period so that variations as a function of beam position are not due to variations in airsmass and surface features.

Lat. Bin means of PCS based on Jan to June 2005

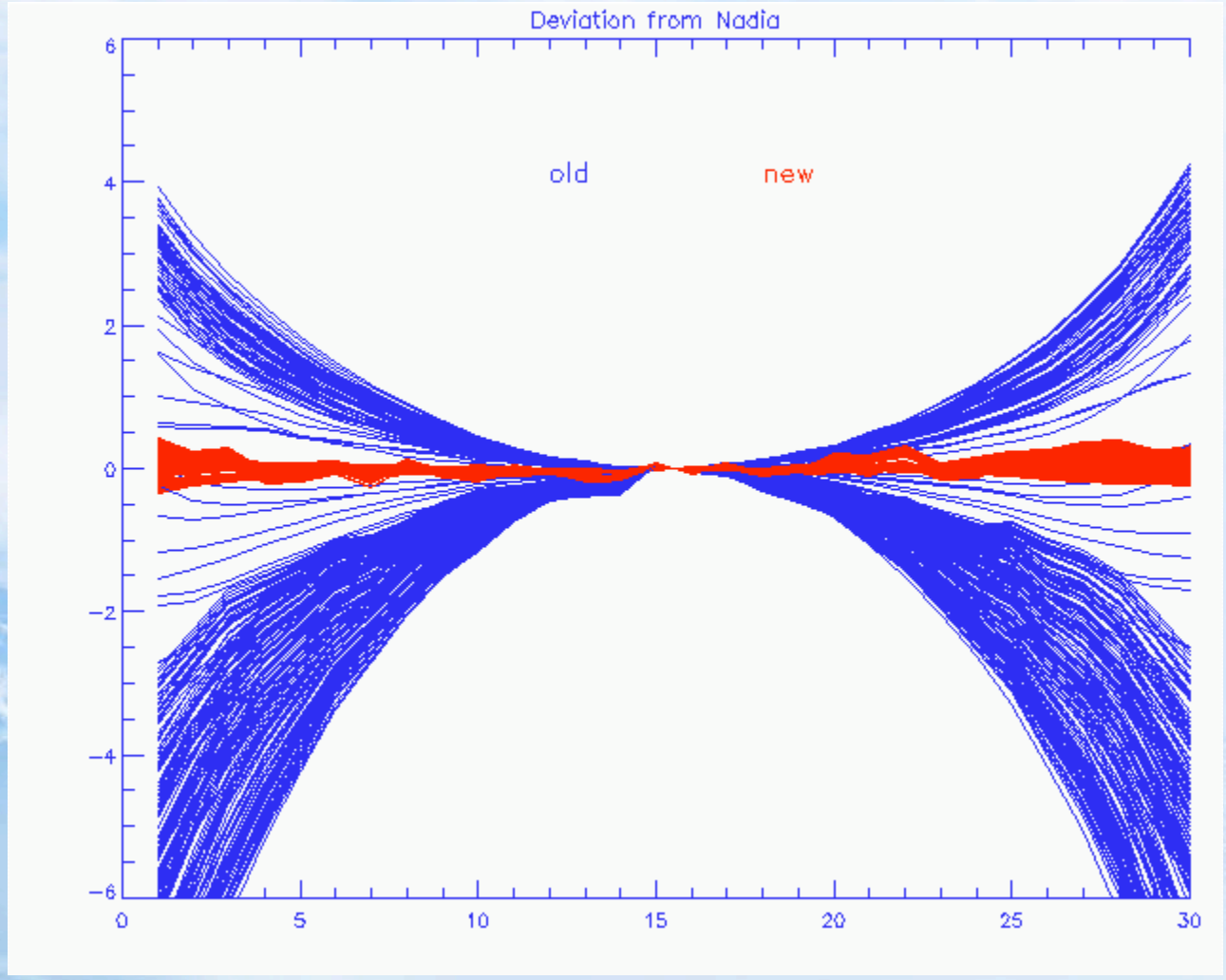




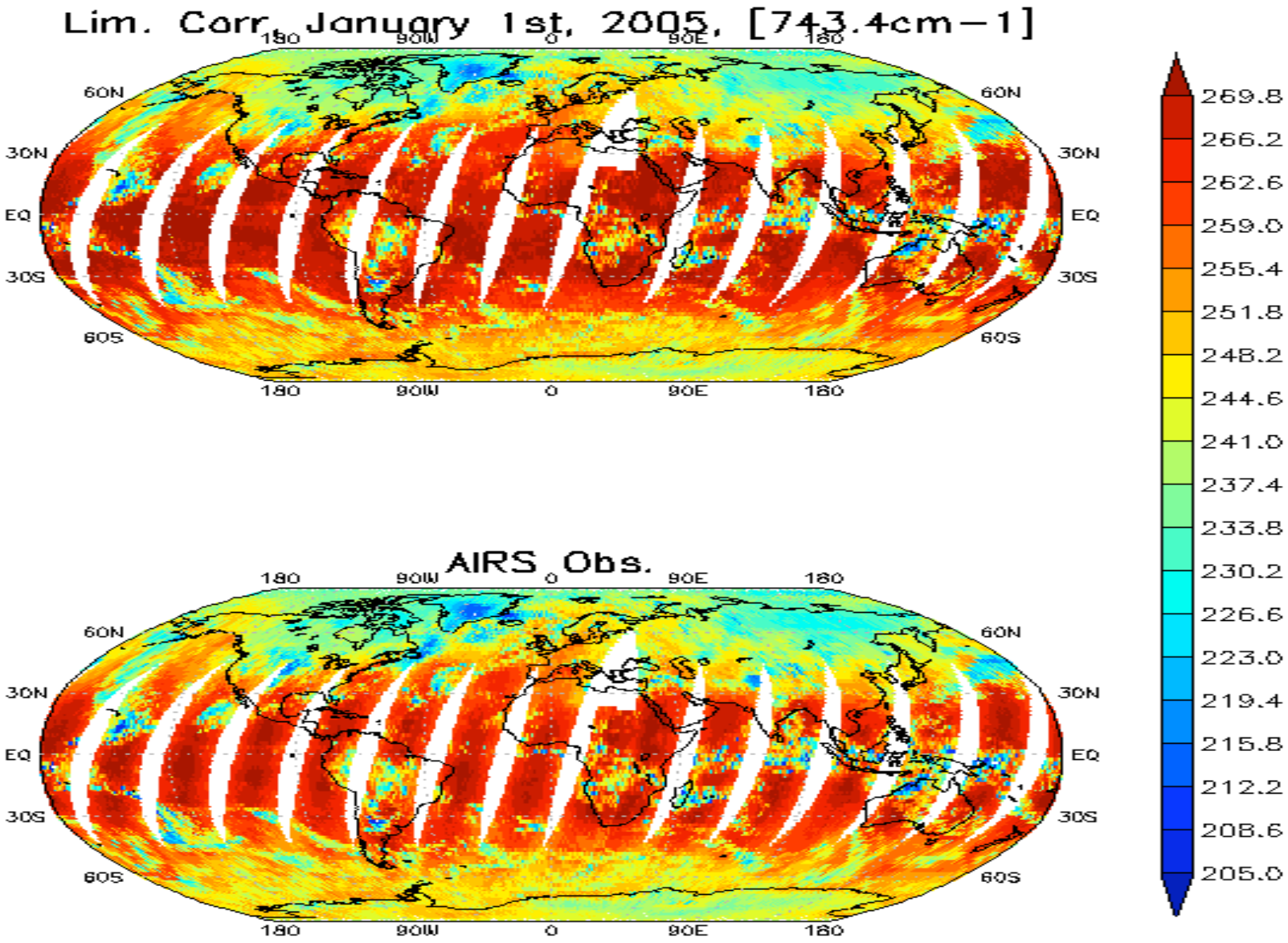




Deviation from Nadir FOV



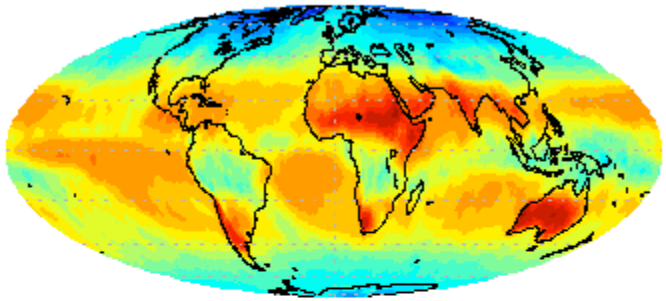
Upper Troposphere



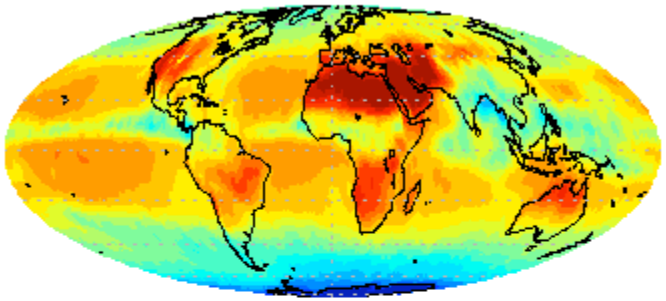
Window

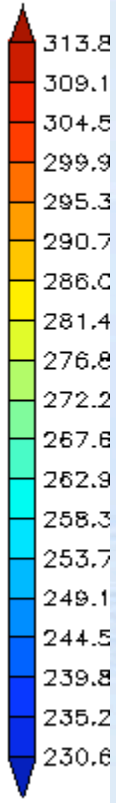
979.017cm−1

Jan Ascending

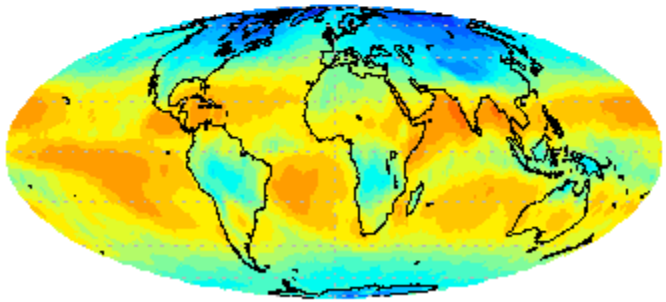


Jul Ascending

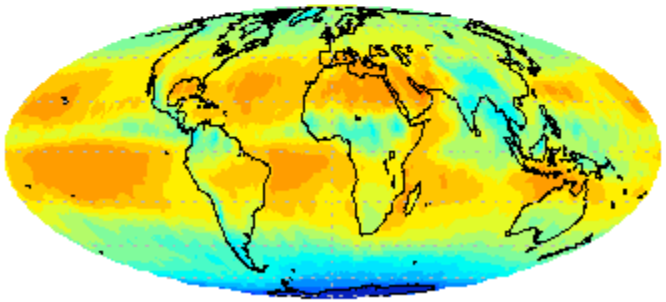




Jan Descending



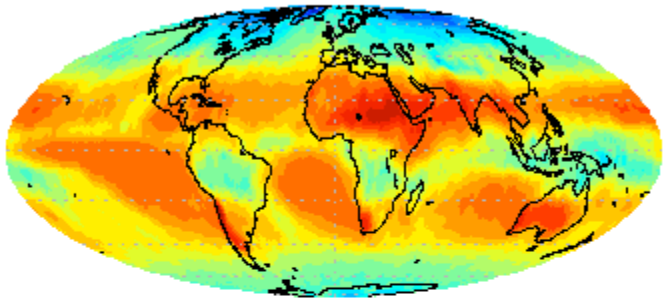
Jul Descending



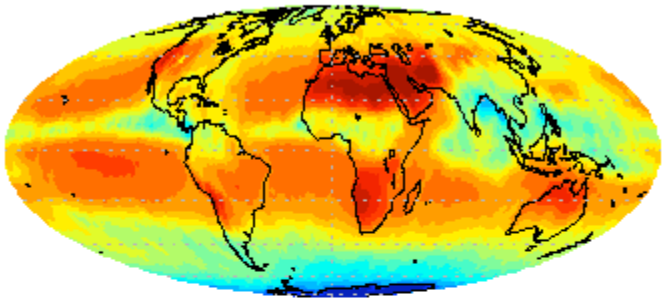
Water – Lower Troposphere

1285.32cm−1

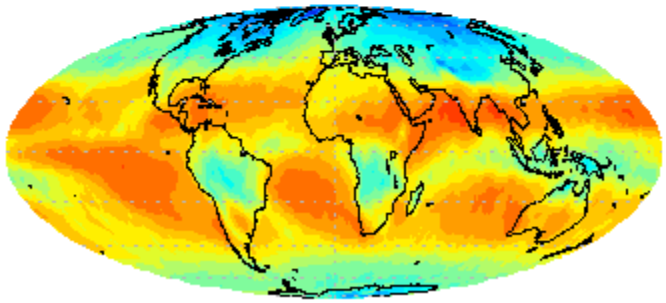
Jan Ascending



Jul Ascending



Jan Descending



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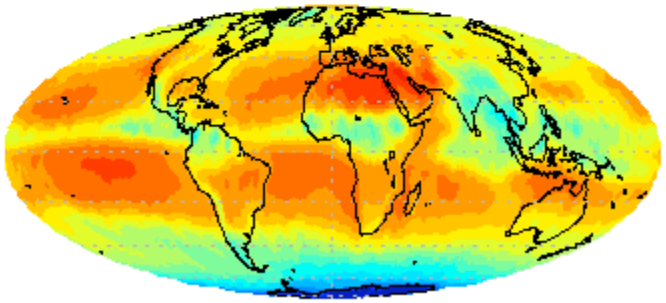
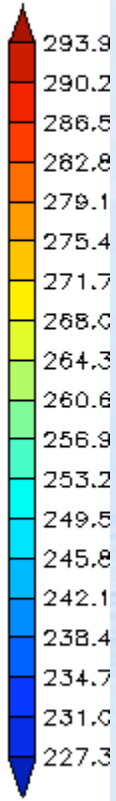
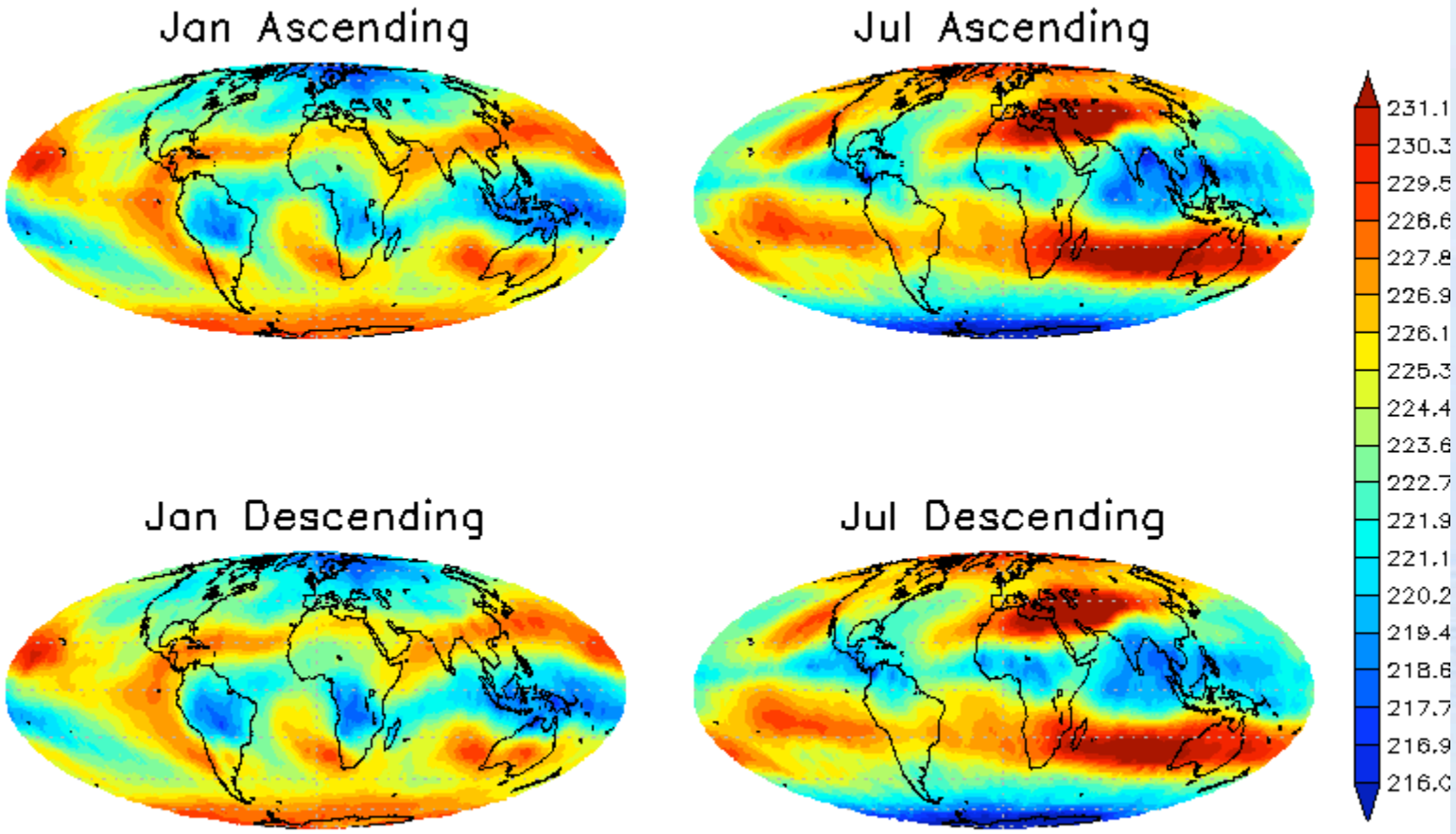
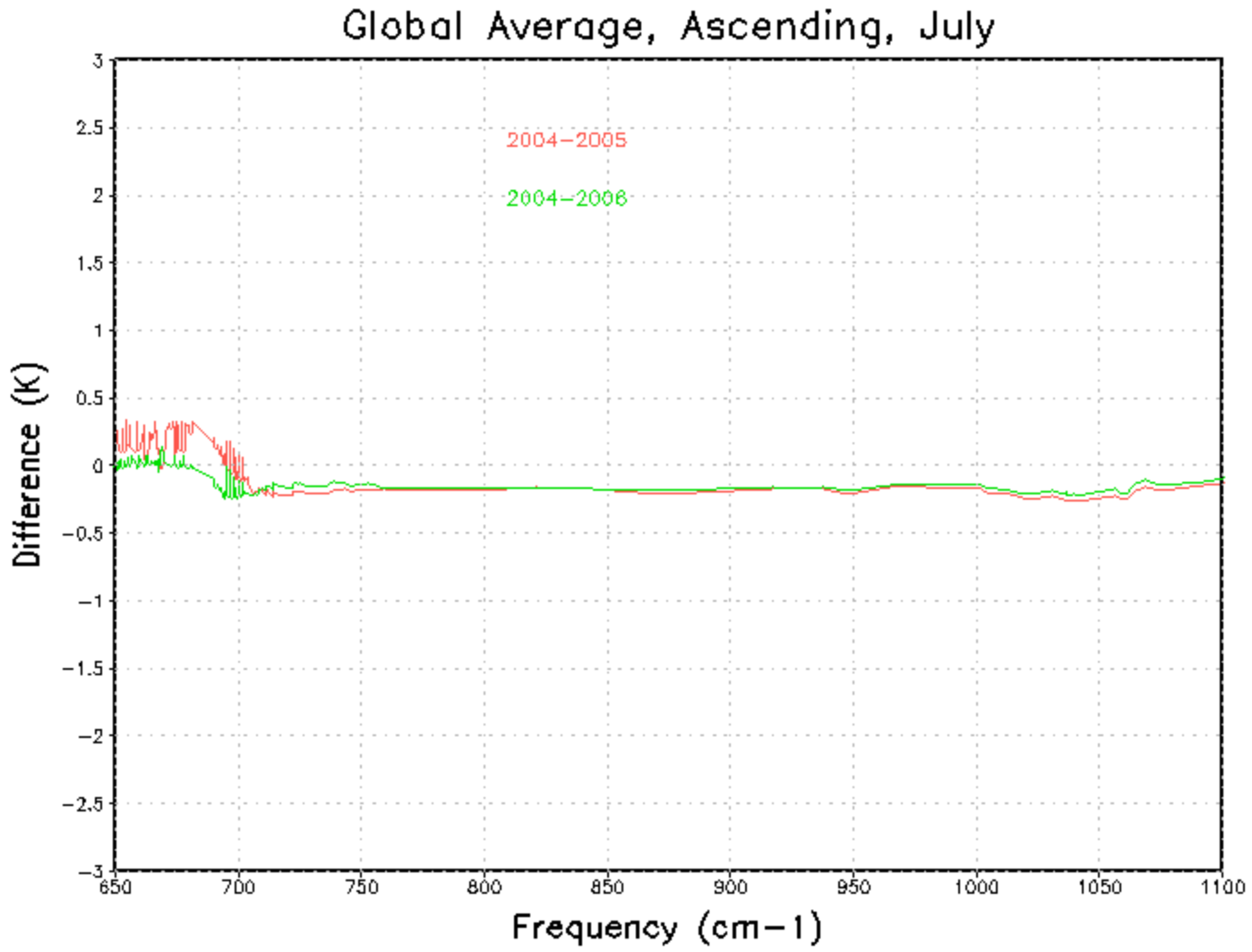


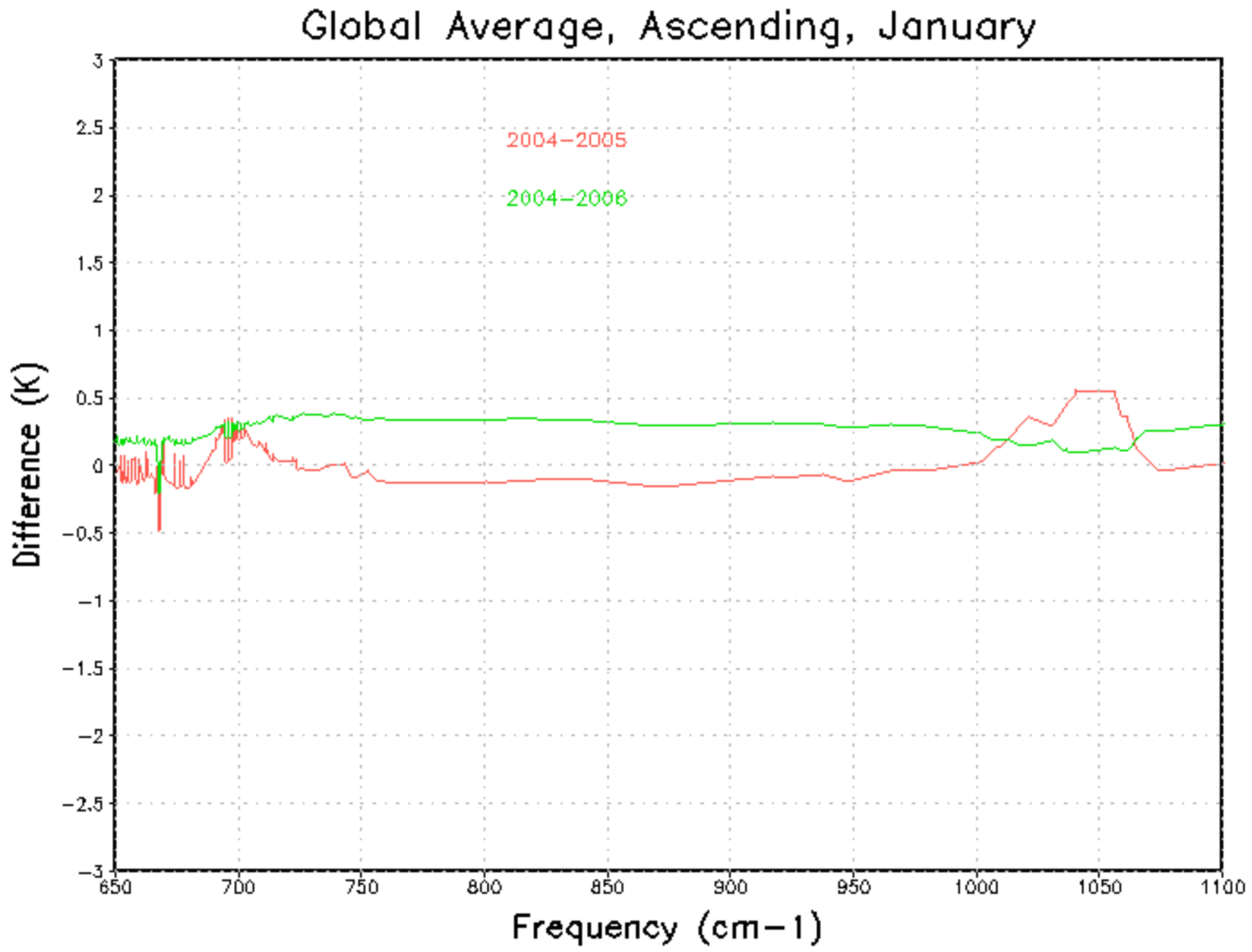


Water – Upper Troposphere

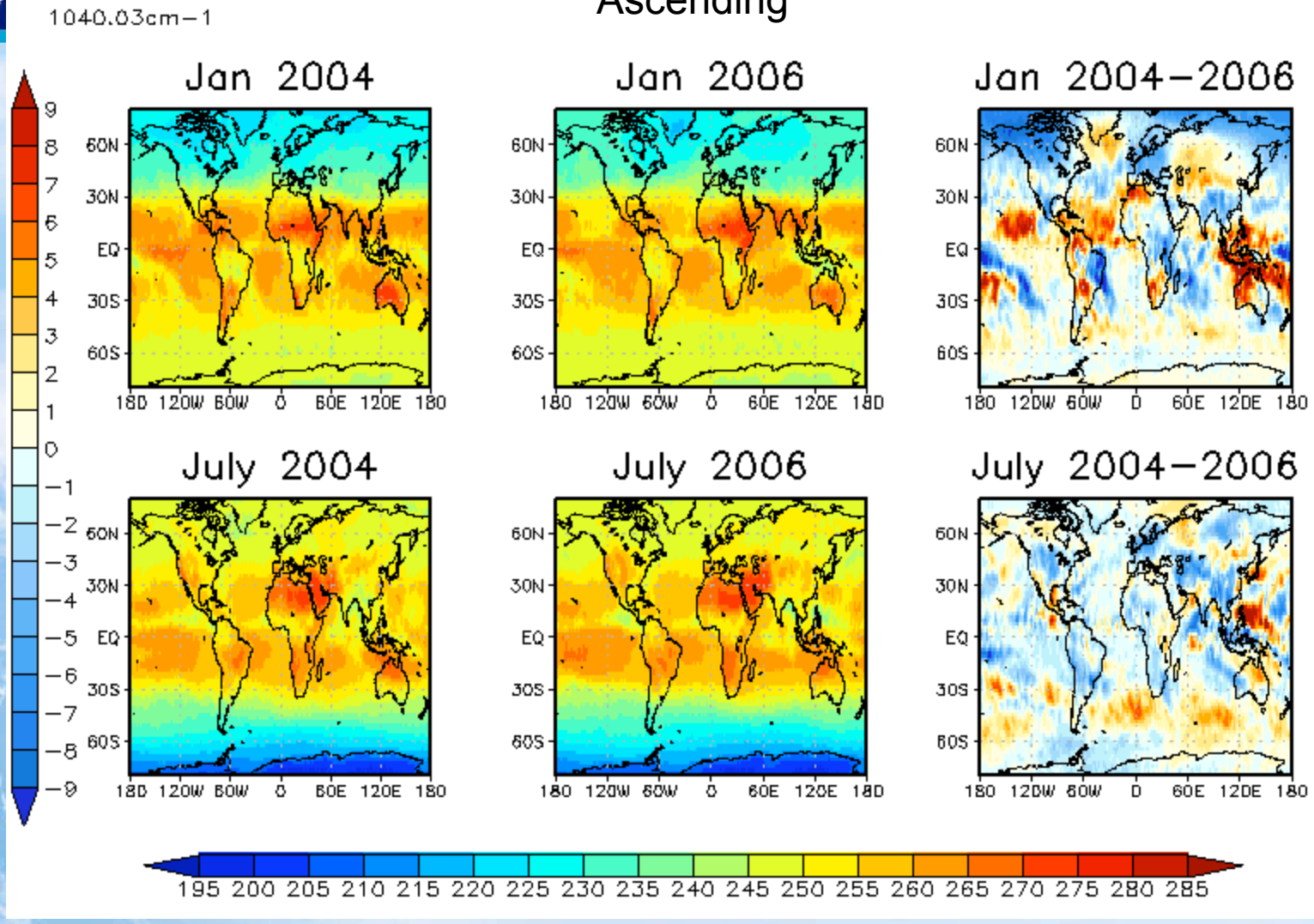
1520.87cm−1



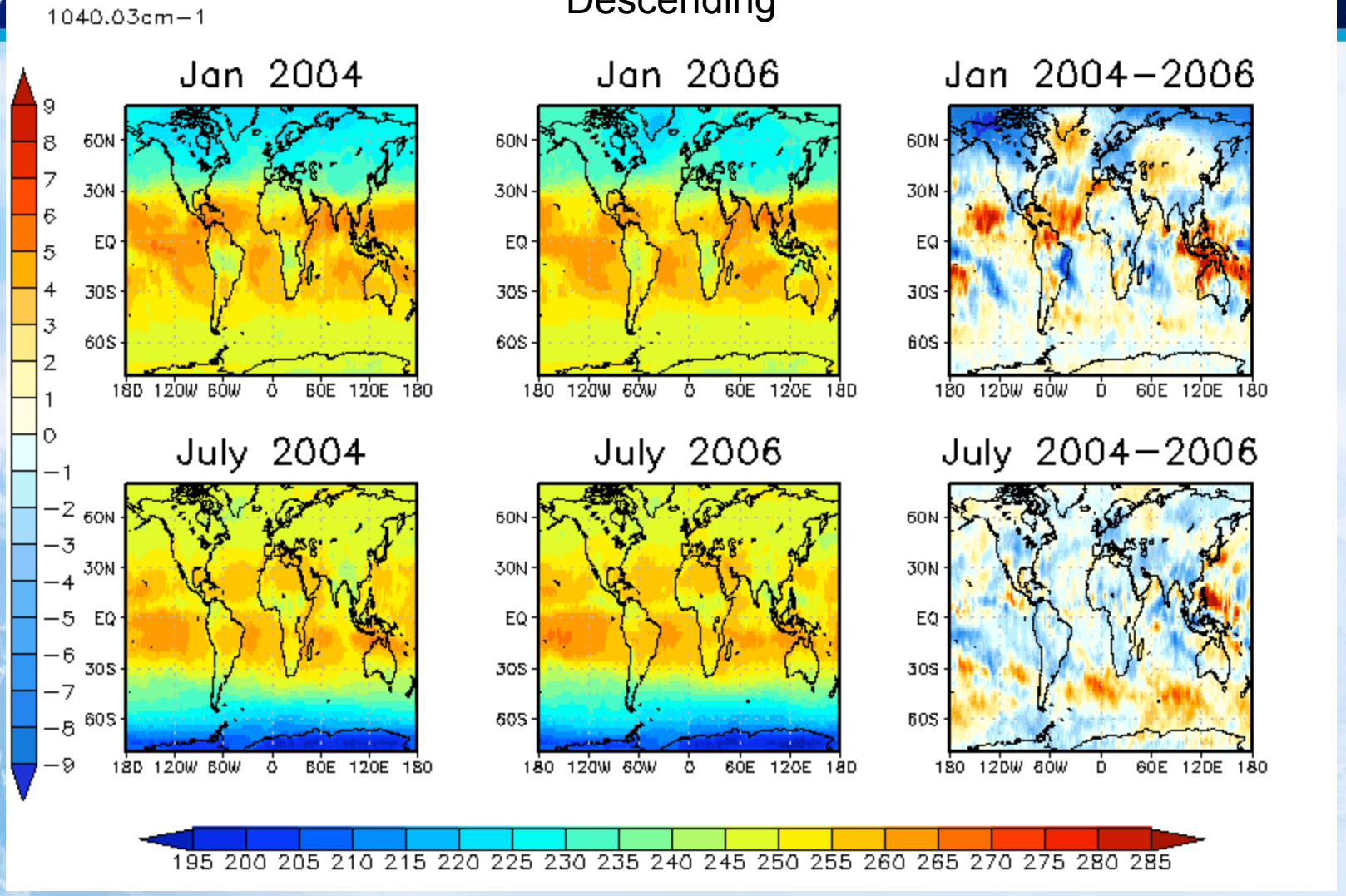

Global Average, Ascending, July
2004-2005
2004-2006
Difference (K)
Frequency (cm-1)
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
650
700
750
800
850
900
950
1000
1050
1100


Global Average, Ascending, January
2004–2005
2004–2006
Difference (K)
Frequency (cm–1)
3
2.5
2
1.5
1
0.5
0
–0.5
–1
–1.5
–2
–2.5
–3
650
700
750
800
850
900
950
1000
1050
1100

Ascending


1040.03cm−1
Jan 2004
Jan 2006
Jan 2004−2006
July 2004
July 2006
July 2004−2006
9 8 7 6 5 4 3 2 1 0 −1 −2 −3 −4 −5 −6 −7 −8 −9
60N 30N EQ 30S 60S
180 120W 60W 0 60E 120E 180
195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285

Descending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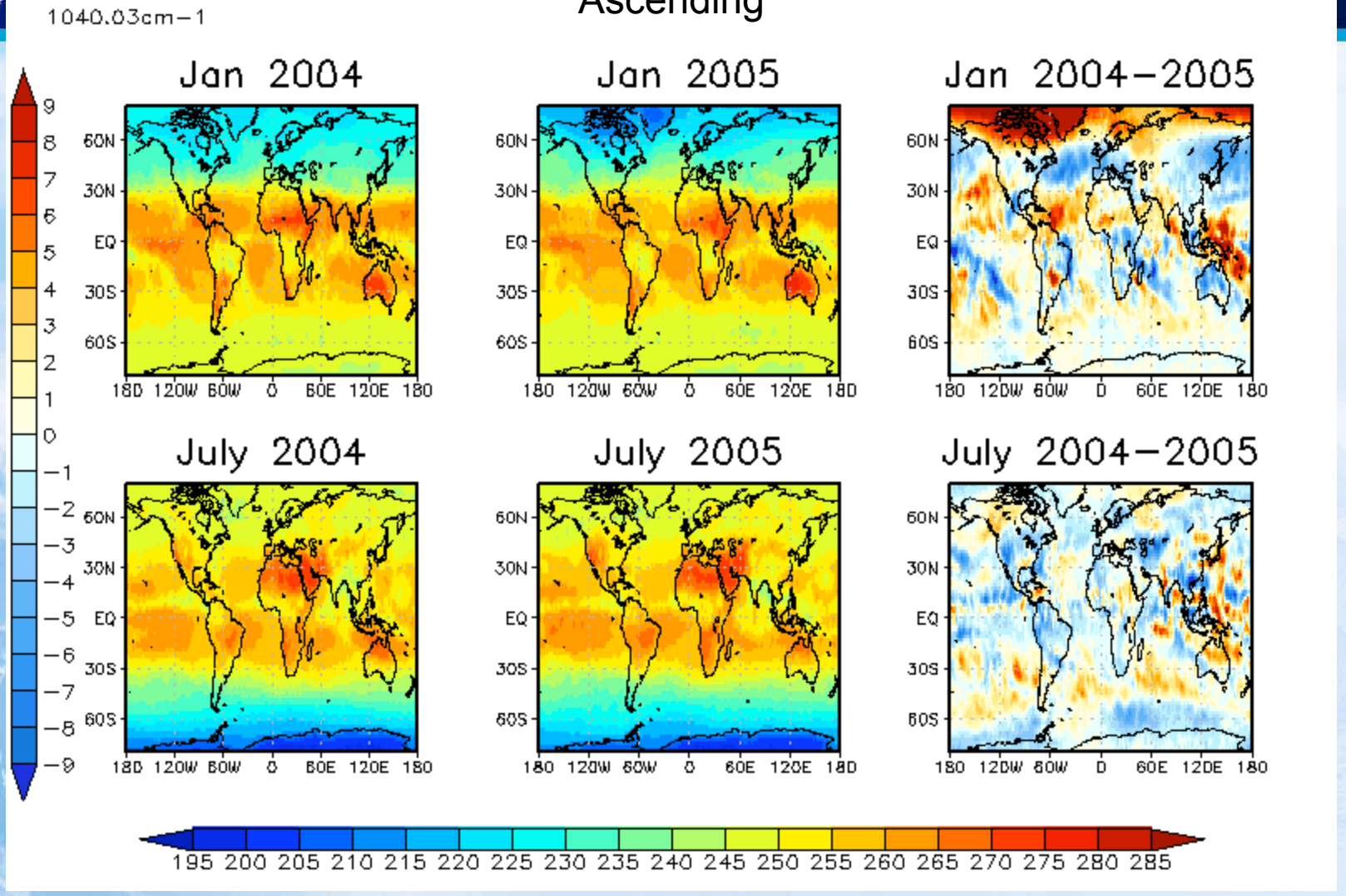
Ascending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Jan 2004
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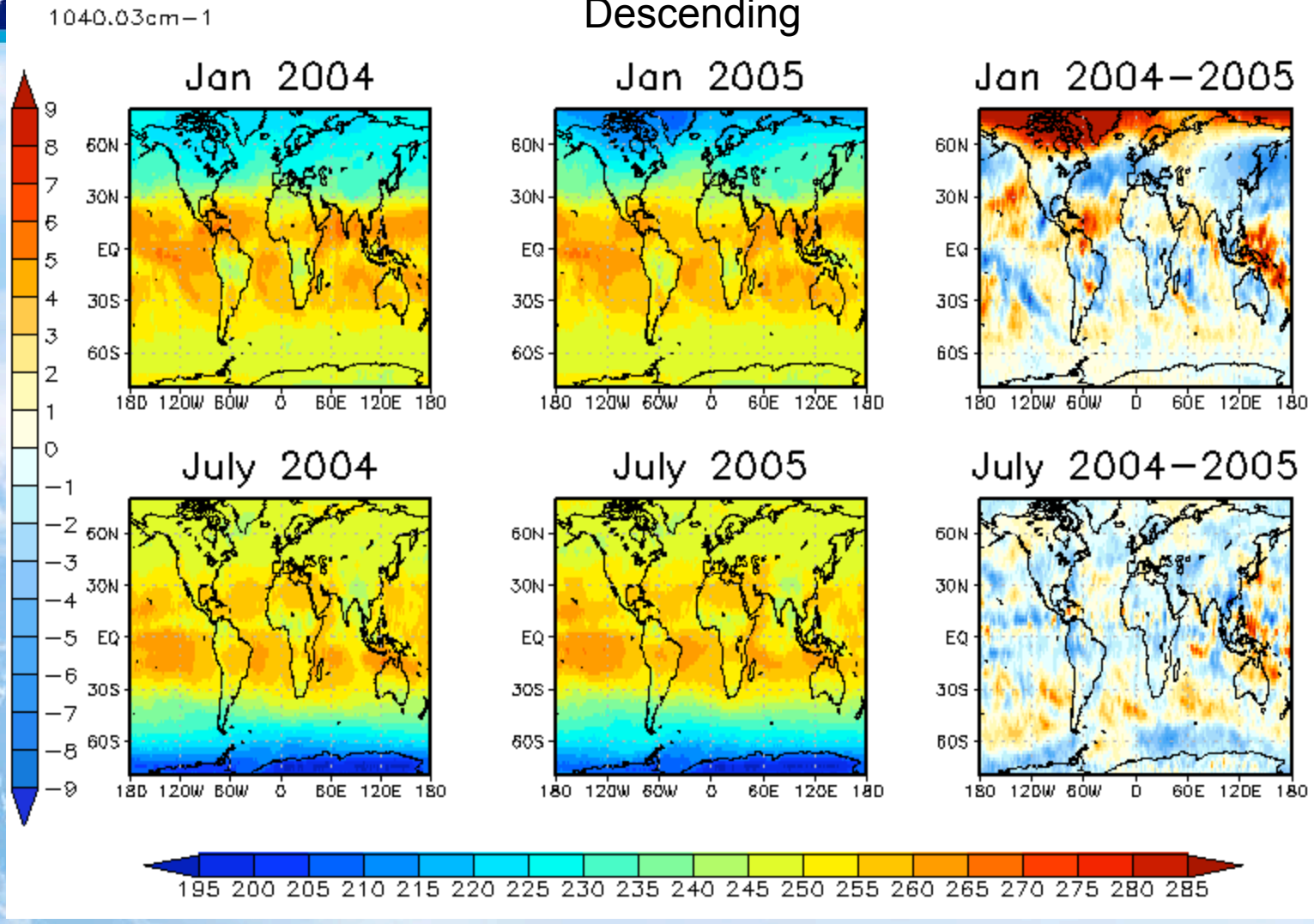
Descending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Jan 2004
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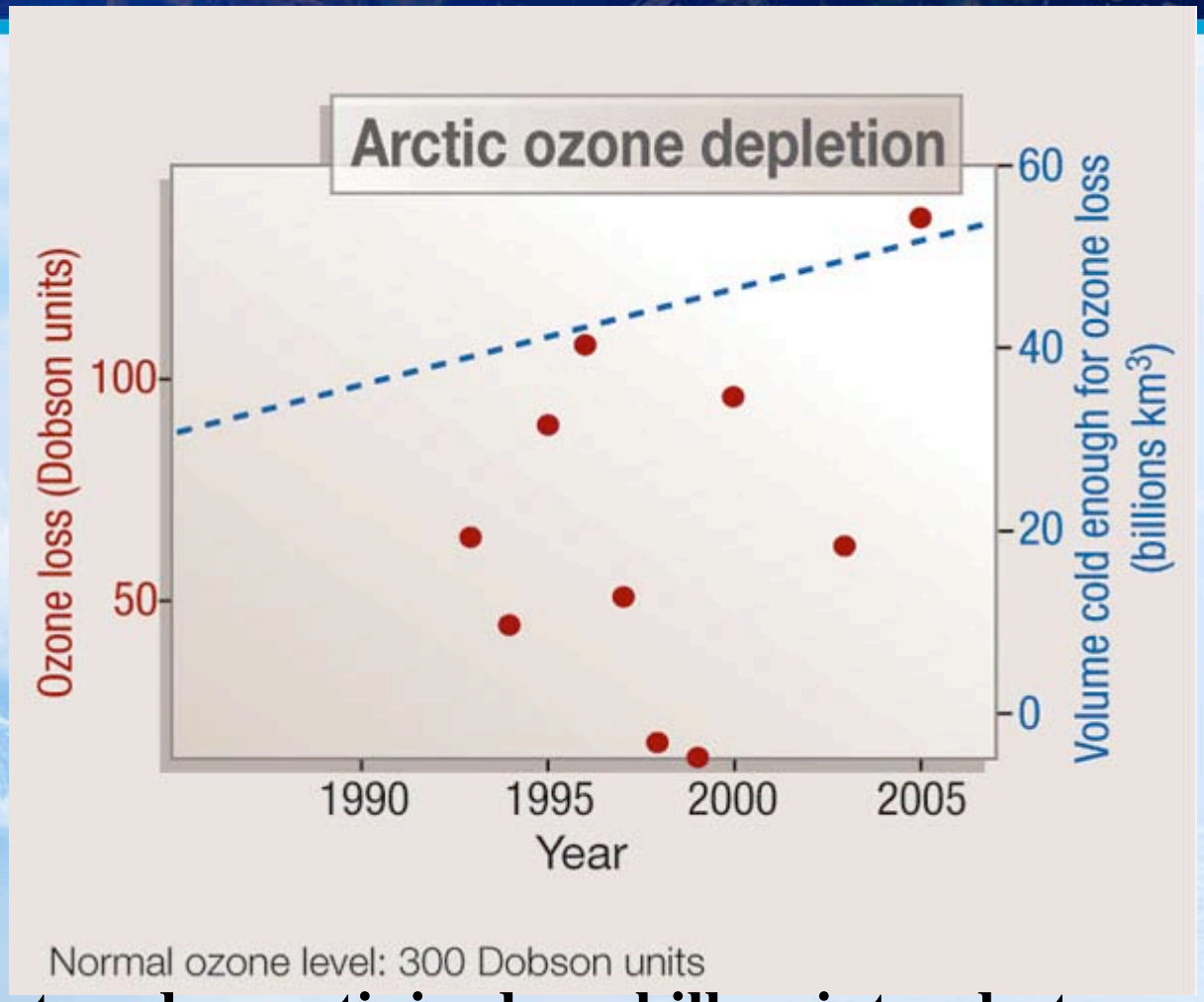
60N 30N EQ 30S 60S
180 120W 60W 0 60E 120E 180
195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285

Ozone Loss



Arctic trends scrutinized as chilly winter destroys ozone

Is climate change to blame for looming northern hole?

Quirin Schiermeier, Nature, 5/5/05

Summary

- Generating monthly maps of limb adjusted radiances.
- Need further validation – test limb adjustment in the PGE
- Next step – generate clear monthly maps to allow studies of cloud forcing